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External communication: a pilot project to update the key messages of the assessment of pollinators, pollination and food production

Note by the secretariat

The annex to the present note sets out an external communication on a pilot project to update the key messages of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) assessment of pollinators, pollination and food production. The external communication was submitted by Mr. Robert Watson, co-investigator of the National Environment Research Council's "ScienceBrief" proposal and Chair of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, and Mr. Simon Potts, director of the Centre for Agri-Environmental Research, University of Reading, and former Co-Chair of the IPBES assessment of pollinators, pollination and food production. The annex is presented without formal editing.

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Annex

External communication: a pilot project to update the key messages of the IPBES Assessment of Pollinators, Pollination and Food Production

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Executive Summary

1. Given the importance of up-to-date scientific knowledge for policy formulation and implementation, ScienceBrief, an innovative on-line web system, will be used to update the 23 key messages of the IPBES Pollinators, Pollination and Food Production Assessment,[1,2] and identify any new and emerging issues of policy relevance and key research needs. This process will involve experts from around the world and be guided by an editorial board primarily consisting of experts nominated and chosen for the IPBES assessment[3]. The plan is to produce a peer-reviewed update by June 2020, with the updated messages submitted as an information document to the eighth session of the IPBES Plenary.

2. This activity will not only update the IPBES key messages, but also provide an accessible data base of new knowledge that all stakeholders can access, involve more experts from around the world in updating the key messages than an IPBES (or IPCC) assessment can involve, and demonstrate the power of ScienceBrief for future uses by IPBES, IPCC and other assessment processes.

[1] We refer to the 23 key messages as the Map of Current Knowledge (MoCK).

[2] IPBES (2016): Summary for policymakers of the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. S.G. Potts, V.L. Imperatriz-Fonseca, et al., Secretariat of the IPBES, Bonn, Germany. 36 pages ISBN: 978-92-807-3568-0.

[3] The members of the editorial board were chosen by Robert Watson (co-investigator on the NERC ScienceBrief proposal and chair of IPBES) and Simon Potts (co-chair of the IPBES pollinators, pollination and food production assessment), in consultation with other pollination experts.

3. This project is being run outside of the IPBES process. Its outcome, a report with updated messages taken from the pollination report, will not be an IPBES product, but an independent report accessible to all. The intent of this project is to explore new methods for updating assessment findings. Such methods may be of interest to IPBES as something which could be considered for incorporation into the procedures for preparation of platform deliverables. They may enable IPBES to more easily undertake regular updates of existing and new assessments as part its future work programmes.

1. Rationale for the update

4. The issue of pollinators, pollination and food production is an important science-policy issue, where decisions need to be made with the best up-to-date scientific information possible. The IPBES "Pollinators, Pollination and Food Production" Assessment, approved by the IPBES Plenary in February 2016, produced policy-relevant messages that were of value to a range of stakeholders, e.g., Governments, businesses and civil society, and served as a basis for a decision by CBD COP 13 on the "Implications of the IPBES assessment on pollinators, pollination and food production for the work of the Convention", and incorporated into their work programs.

5. The assessment also triggered the launch at the high-level segment of CBD COP 13 of the "Coalition of the Willing" (www.promotepollinators.org), a group of countries committed to halt the loss of pollinators and pollination services, and is underpinning several national strategies to promote pollinators and polination.

6. The cut-off date for when the IPBES assessment could consider new research papers was when the draft assessment was submitted for the second-order expert and Government review, i.e., June 2015. Since June 2015, there have been about 10 research papers published each day in the scientific literature that are of relevance, albeit to differing degrees, to the key messages of the IPBES assessment, i.e., over 10,000 papers have been published since the cut-off date for considering new information.

7. The question is whether this new scientific evidence confirms and strengthens the key messages, thus increasing the confidence levels, or weakens or refutes them, thus decreasing the confidence terms, or requires changing the messages completely. Further, new areas of knowledge have started emerging (e.g. threats from light pollution) since the assessment was undertaken.

8. Consequently, it would be important, given the fact that policies should be developed and implemented based on the best available credible scientific information, to consider updating the IPBES assessments. What is being proposed here is a project run outside of the IPBES process. Its outcome, a report with updated messages taken from the pollination report, will not be an IPBES product, but an independent report accessible to all. The intent of this project is to explore new methods for updating assessment findings. Such methods may be of interest to IPBES as something which could be considered for incorporation into the procedures for preparation of platform deliverables. They may enable IPBES to more easily undertake regular updates of existing and new assessments as part its future work programme.

2. What is ScienceBrief and how will it be used to update the key messages of the IPBES pollinators assessment?

9. The on-line ScienceBrief system will be used to identify and assess all new literature published in scientific journals since the IPBES assessment deadline for incorporating new evidence. The operating principles and technical details of ScienceBrief are described in detail in Appendix I.

10. ScienceBrief is a novel transparent online platform to facilitate assessing published scientific results from authors around the world on any given topic. Initially ScienceBrief will address three different scientific domains:

    a) Pollinators, Pollination and Food Production;
    b) Carbon-climate interactions; and
    c) Energy-nature interactions.

    Beyond these pilot domains there is significant scope for further use in many other topical scientific fields (the potential use by IPBES is discussed later).

11. ScienceBrief enables scientists to select, appraise and incorporate new evidence into scientific assessments such as the IPBES and IPCC[4] from wherever they work. ScienceBrief helps assess if, and to what extent, new publications alter current knowledge, e.g., the key messages of the IPBES Pollinators assessment. ScienceBrief assists in understanding the status and strength of scientific consensus surrounding research topics in critical areas such as biodiversity and ecosystem services, and climate change. It also contributes to identifying gaps for further research needs. Overall, ScienceBrief is a state-of-the-art online system that enables the international scientific community, supported by an expert editorial board, to assess scientific knowledge in support of strengthening the science-policy interface and society at large.

12. ScienceBrief builds on existing scientific assessments such as IPBES and IPCC. The starting point of ScienceBrief is a set of key statements produced by the Editorial Boards based on existing scientific assessments where they are available, e.g., the 23 key messages of the IPBES pollinators assessment. Contributors submit and interpret relevant evidence on each of the key messages, which is then appraised by the expert community and the editorial board. The combined submissions and peer appraisal result in an assessment of the status and strength of scientific consensus on each of the key messages, and highlights sources of certainty and uncertainty as well as further research needs. Emerging issues in a domain such as pollinators, pollination and food production will also be evaluated even though no prior-assessment exists.

2.1: ScienceBrief

13. ScienceBrief:

- Provides new opportunities for contributions of scientists worldwide and at all career-stages, providing a rich and diverse input to existing assessment processes. Scientists contribute relevant papers on current topics and appraise each other's work;
- Has multiple mechanisms of quality control, including Editorial Boards, a filter of acceptable publications (primarily peer-reviewed literature), a process for validating experts;
- Builds on existing international scientific bodies, e.g., IPBES, to support and strengthen their assessment processes;
- Facilitates the gathering of new references, their interpretation, and the collation of written contributions by experts on the topic. No more 'why did you not cite my paper?' as a comment in assessment reviews; and
- Helps enhance transparency in scientific assessments through the process of publicly-visible submissions and evaluation of evidence. Changes within the system are logged and available as a historic record. Experts who appraise publications are not identified to enable free and forthright peer-reviewing.

2.2: Expected outcomes

14. The expected outcomes of ScienceBrief will include:

- Regular and timely updates of the state of knowledge on a given topic, e.g., pollinators, in the context of rapidly growing literature, identifying where scientific consensus exists and where it does not;
- Identification of key knowledge gaps and uncertainties leading to new insights into further research needs;
- Increased transparent and accessible science in support of the science-policy interface, by involving a greater number of experts that can be accommodated in an IPBES or IPCC assessment; and
- A cost-effective and less time intensive[5] approach to updating decision-makers in Government, private sector and civil society on key messages.

[4] IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

[5] ScienceBrief is less time intensive because the work-load is more distributed (a greater number of experts will be involved compared to an IPBES assessment) and other than the editorial board the experts do not travel (which saves money and carbon dioxide emissions, hence more climate-friendly).

2.3: *Key stakeholders*

15. The key stakeholders involved in ScienceBrief include:

- *Contributors* – researchers with self-declared expertise in the field submitting their or others published evidence to the key statements;
- *Top experts* – authors of publications submitted as evidence to the key statements;
- *Editorial Board members* – experts who create/update key statements and monitor submissions and are ultimately responsible for the domain findings; and
- *Audiences* – the target audiences of ScienceBrief are interested informed people including science media, decision makers in the private and public sectors, NGOs, the academic community, and students.

2.4: *The Process*

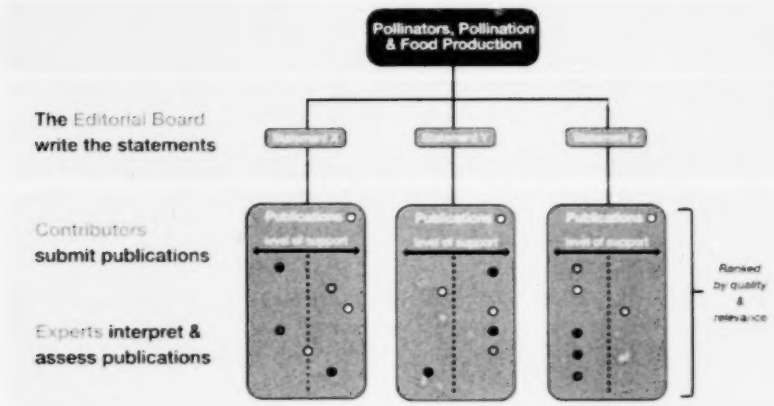
Pollinators, Pollination & Food Production
The Editorial Board write the statements
Contributors submit publications
Experts interpret & assess publications
Publications
Ranked by quality & relevance

Figure 1: Schematic representation of the structure and process of building knowledge within an example domain. The dots in each box represent new publications, with their location showing the degree to which the new evidence supports or contradicts the statement (i.e., the current state of knowledge). Dots to the right support the statement, while dots to the left contradict the statement. Therefore, in statement x there is a mixture, with some new evidence supporting the statement, while other new evidence tends to contradict the statement, in statement y, the new evidence tends to support the statement, where-as in statement z most of the evidence tends to contradict the statement. The editorial board would then assess whether in each case the original statement needs to be modified and if so, how. It is expected that each statement will attract 50 to 200 publications in a 2-year period, possibly more for controversial statements.

2.5: *Governance*

16. Beyond the pilot phase, ScienceBrief will have a governing body to decide on domains and support strategic developments and funding. It will be steered from the Tyndall Centre at UEA by Corinne Le Quere and Bob Watson, and will include international advisors related to key stakeholders (e.g. IPCC and IPBES).

3. Who will conduct the update of the IPBES pollinators assessment and what is the final deliverable?

3.1: Who will conduct the update?

17. The international scientific community will contribute new evidence relevant to each of the IPBES pollinators key messages and experts will judge to what degree the new evidence supports the key messages or not. A scientist will be hired to assist in identifying relevant new research papers and inputting them into the system.

18. Box 1 shows an example of the type of input that would be expected. The Map of Current Knowledge (MoCK) statement and extended statement that supports the key finding are taken directly from the key messages (e.g. number 18) of the IPBES summary for policymakers pollinators assessment. The contributor then provides their name, the title, authors and reference of the journal article (mostly done automatically), a tag, which indicates whether the contributor assesses the new paper to support, mostly supports, informs, mostly refutes or refutes the MoCK statement (in this example the contributor assesses that the paper mostly supports and informs the MoCK statement), and a short interpretation (up to 75 words) that explains the rationale for their tag assessment. The corresponding author of the journal article is then invited to say whether they agree with the contributor's submission, and if not are free to modify it. Other experts can then comment on the submission and agree or disagree with the tag and interpretation. Therefore, each new piece of scientific evidence is evaluated by experts across the world.

Box 1: Example contribution for pollinators, pollination and food production

MoCK statement: The risk to pollinators from pesticides arises through a combination of toxicity and the level of exposure, which varies geographically with the compounds used and the scale of land management and habitat in the landscape. Pesticides, particularly insecticides, have been demonstrated to have a broad range of lethal and sub lethal effects on pollinators under controlled experimental conditions (key finding #18 of the IPBES pollinators SPM).

MoCK extended statement: The few available field studies assessing effects of field-realistic exposure provide conflicting evidence of effects based on species studied and pesticide usage. It is currently unresolved how sub lethal effects of pesticide exposure recorded for individual insects affect colonies and populations of managed bees and wild pollinators, especially over the longer term. Recent research focusing on neonicotinoid insecticides shows evidence of lethal and sub lethal effects on bees and some evidence of impacts on the pollination they provide. There is evidence from a recent study that shows impacts of neonicotinoids on wild pollinator survival and reproduction at actual field exposure. Evidence, from this and other studies, of effects on managed honey bee colonies is conflicting (supporting evidence for key finding #18 in the IPBES pollinators SPM).

Contributor: Dr Ima Scientist
New publication: Woodcock et al. (2017) Country-specific effects of neonicotinoid pesticides on honey bees and wild bees. Science 356: 6345
Tag (supports/mostly supports/informs/mostly challenges/refutes):

- Mostly supports, i.e. "effects on managed honey bee colonies is conflicting"

Interpretation (75 words):
A large field experiment in Hungary, Germany and UK showed that oilseed rape treated with commercial rates of two neonicotinoids had mixed effects on honeybees. In Hungary, clothianidin resulted in fewer egg cells and smaller colonies. In UK, clothianidin led to fewer workers and storage cells, but thiamethoxam led to more storage cells. In Germany, clothianidin resulted in more egg cells. Overall, the majority of effects were statistically non-significant.

19. Based on the expert input the editorial board will judge to what degree the original key finding and its level of confidence need to be changed. The draft update of the key messages by the editorial board will then be

submitted to expert review[6] before being finalized by the editorial board. Experts will have access to all the new scientific findings on the ScienceBrief web site to base their comments – a very open and transparent system. The revised set of key messages will be put on the ScienceBrief web page and forwarded to IPBES.

20. The composition of the editorial board is being carefully chosen to reflect geographic, intellectual and regional balance. In order to ensure continuity with the IPBES pollinators assessment, and Government and stakeholder confidence in the members of the editorial board, the majority of the 20-member board are being selected from within the co-chairs, coordinating lead authors and lead authors of the IPBES pollinators assessment. The list of members is currently being finalised. Bob Watson will be the overall coordinator of this assessment, and Simon Potts will be a co-chair of the editorial board.

3.2: What is the final product?

21. The final product of this pilot assessment using ScienceBrief will be a short report (about 20-40 pages), containing an updated set of key messages, including confidence statements, identification of any new and emerging issues of policy relevance, key research needs, and supporting text providing the rationale for the revised key messages. This final product would be an independent report, and not an IPBES product.

4. Time schedule

Phase I: January 1, 2018 to September 30, 2018

22. Phase I would be organised as follows:

- Advertise the project on the UEA, Future Earth, IPBES and IPBES-partner web-sites
- Contact all CLAs, LAs, CAs and REs of the IPBES pollinators, pollination and food production assessment to explain the project
- Contact all relevant experts, e.g., those cited in the IPBES pollinators, pollination and foods production assessment, including early career scientists and researchers in developing countries
- Hold initial meeting of the editorial board to develop and implement a strategy for involving the international scientific community in this new activity
- Prepare the initial Map of Current Knowledge (MoCK) based on the 23 key messages from the IPBES pollinators, pollination and food security assessment – resulting in 23+ windows of knowledge (a couple of windows will be available for new key areas of relevant research
- Test the system, rectify issues and deploy security measures by piloting a couple of the windows, i.e., inputting new information relevant to a couple of the key messages

Phase II: October 1, 2018 to September 30, 2019

23. Phase II would be organised as follows:

- Develop the ScienceBrief on-line system with publications relevant to each of the 23 key messages and start to develop an assessment of which of the IPBES key messages have been further strengthened through new evidence (confidence statement strengthened), where the new evidence has supported but neither strengthened or weakened an IPBES key finding (confidence statement unchanged), or where new evidence has disagreed with a previous IPBES key finding and the finding may need to be changed.
- If relevant new issues, not covered by the 23 IPBES key messages, are discovered the editorial board would support one or more additional windows to collect new information on these new and emerging issues.

[6] We would hope that experts in Government would participate in the review process.

Phase III: October 1, 2019 to June 30, 2020

24. Phase III Phase I would be organised as follows:

- Editorial board evaluates all new evidence, and the expert's views of that evidence, and develops a draft revised MoCK, i.e., an updated set of key messages, and associated text that justifies the revised findings (a 20-40 page report, similar to an IPBES assessment SPM);
- The revised MoCK is sent for expert review;
- The editorial board meets to finalize the revised MoCK taking into account expert comments;
- The editorial board submits its findings, i.e., a peer-reviewed revised set of key messages to IPBES as an information document to the eighth session of the Plenary.

Phase IV: IPBES Plenary

25. The IPBES Plenary, possibly at its eight session, or earlier, could consider whether to adopt a mechanism to update its future assessments[7], as part of the second IPBES work programme, based on the pilot phase of ScienceBrief tool, and, if so, could request the development of a set of guidelines/principles and procedures for its use.

5. Other potential uses of ScienceBrief for IPBES assessments

26. If the ScienceBrief pilots prove successful and engage the international scientific community and provide the community with credible peer-reviewed scientific knowledge through a fully transparent process, then it could be applied to a wide range of issues of interest to IPBES. It could be used to provide updates of any IPBES thematic, methodological, or sub-regional/regional/global assessments. For example, an update of the regional and sub-regional assessments, or a number of issues contained within them, an update of the land degradation and restoration assessment or a sub-set of the issues contained within it, or an update of the scenarios and models assessment.

27. Each assessment would need an editorial board, whose membership could be nominated by IPBES member States and partners and selected by MEP/Bureau, in a manner analogous to that used to nominate experts for IPBES assessments.

28. The cost of updating an IPBES assessment, or elements of an IPBES assessment would be significantly lower than conducting the original IPBES assessment using current procedures – a factor worth considering given the financial limitations of IPBES[8]. A revised set of Principles and Procedures could be developed specifying the role of the editorial board, peer-review processes and acceptance and approval processes. ScienceBrief would be less applicable for an issue that had not previously been assessed by IPBES, given the need to develop a Map of Current Knowledge (MoCK) as the initial starting point for an assessment, although emerging topics are currently being tested on the ScienceBrief platform. A ScienceBrief update assessment can be performed in two years or less or more as required.

29. The initial likely cost of each ScienceBrief update proposal would be between $500,000 and $600,000 over two years, but potentially decreasing for future updates, based on: (i) a one-person technical support unit who would assist in identifying recent literature, contacting[9] the authors of the scientific papers, managing the peer-review process, preparing the report of the new key messages; and supporting the editorial board; (ii) a half-time web-designer to maintain and update the on-line web system; (iii) travel costs for one meeting per year of the editorial board (about 20 members per editorial board); (iv) travel costs for the co-chairs of the editorial board to attend

[7] ScienceBrief is currently best suited to updating assessments (part or all) given the need to develop a map of current knowledge (MoCK). This means that post IPBES-7, ScienceBrief could be used to update some or all of the approved IPBES assessments, i.e., pollination, scenarios and models, four regional assessments, land degradation and restoration, and global, to be decided by the IPBES Plenary.

[8] The cost of updating an assessment could decrease in the future as the system will be more fully developed and the costs of maintaining and updating the system could be shared among multiple assessments.

[9] The authors will be contacted automatically but initially a lot of prompting will need to be done until people find out about the project.

one IPBES MEP/Bureau meeting and one IPBES Plenary; and (v) printing and disseminating the updated set of key messages (about a 25-50 page report).

6. Acknowledgements and current funding

30. The ScienceBrief platform is developed by researchers at the University of East Anglia with funding from the UK Natural Environment Research Council under its International Opportunities Fund (project number NE/N013891/1). ScienceBrief pollinators is supported with in-kind contributions from Reading University. A request for funding for this activity will be sent to a number of Governments, outside of the IPBES process.

Appendix: Technical Description of ScienceBrief

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1 Document Introduction and Purpose

This is a technical document for the ScienceBrief platform that describes:

- The intended functionality of the platform;
- Intended user groups and descriptions of roles;
- The operational process (how users interact with the platform and the flow of operations); and
- Implementation details (how and when the platform will be implemented).

This technical document details the requirements and specifications of the software under construction.

ScienceBrief is being developed with funding from the UK NERC International Opportunities Fund under the project named Knowledge Assessment Platform for the Valuation of Energy and Nature together (KAPtEN). Within KAPtEN, ScienceBrief will be tested within three pilot domains (see Section 8). Once tested and validated, the domains will be broadened to cover other areas initially in Earth sciences, and possibly in all sciences at a later date. The tools and techniques may also be applicable in other areas (see Domain Constraints and Generic Use).

The three pilot domains will serve to test the operational aspects, results and user experience. The text below details the initial constraints that will be revisited during the evaluation of the pilot results.

1.1 Glossary of Terms used in this document

Domain	Specific area of scientific research in which the platform will be used
Emerging Topic	New area of scientific research for which there is little evidence but rapidly growing interest
Grey Literature	Literature which is not peer-reviewed but of high quality and from recognised (mostly public) organisations (e.g. the World Bank or Governmental reports)
MoCK	Map of Current Knowledge – collection of 15-25 statements that describe the current scientific understanding within a domain. The MoCK is linked to an assessment where possible and has a time stamp.
MoNK	Map of New Knowledge – collection of new publications that appeared since the MoCK time stamp, and their self-organisation through ScienceBrief contributions, that together test, confirm, or complement the current knowledge as described in the MoCK.
Publication	Piece of evidence submitted against a statement, initially including peer-reviewed papers, with soon also grey literature reports[10] as considered by IPCC and IPBES. Other publications such as Indigenous and Local Knowledge (IKL) are considered for a later stage.

[10] The ability to add grey literature is a feature under development

Peer-Reviewed Literature	Literature which has been the subject of a review and assessment by peers prior to publication in established journals. This is the highest-quality standard for scientific publications.

2 Introduction

ScienceBrief is a web platform that aims to build a collaborative community of experts to support the assessment of knowledge, and identify consensus and controversies, within a given scientific domain.

The ScienceBrief mission statement for the initial implementation is:

"ScienceBrief: Expert evidence, consensus, and controversies in science"

ScienceBrief will support scientific assessment bodies such as the IPCC and IPBES, by facilitating the comprehensive and transparent review and assessment of literature and helping to define how it informs current understanding. ScienceBrief will provide the opportunity for *all* scientists to contribute to inform assessments, by being involved in the literature review part of the assessments and doing the initial step of identifying how recent papers feed into existing understanding. As the scientific literature grows, particularly on rapidly-expanding fields like climate change and biodiversity and ecosystem services, ScienceBrief could provide key and necessary assistance that will help maintain the high-quality of assessment processes[11].

2.1 Expert input

The aim of ScienceBrief is to stimulate input from a community of experts, from academia, public and private research bodies, in order to expand the scientific base of the knowledge that informs scientific assessments such as IPCC and IPBES. The concept of involving a large number of scientific experts is such that with a sufficient number of participants, even with a controversial topic, an overall consensus, recursive theme(s) and issues, or controversies, may emerge. At the minimum, the experts provide an informed and extensive literature review self-organised in relevance and associated to previous knowledge.

2.2 Evidence-base for the Assessment of Knowledge

ScienceBrief is focused on contributions by experts and thus it is different from most community knowledge platforms (see Similar Systems), which do not have a tight quality-control system. It is not a platform for opinion. It is a platform to gather and link new evidence, in order to develop a shared and up-to-date understanding of the state of scientific knowledge. The quality-control is exerted in multiple ways: (i) the oversight of an Editorial Board, (ii) the filter of acceptable publications, (iii) the use of the publication's corresponding author as top experts, and (iv) the self-declaration of expertise by contributors linking publications.

Publications will be mainly from peer-reviewed journals, but will also include limited grey literature as defined by the IPCC and IPBES as soon as technically practical (anticipated mid-2018), clearly labelled as such (for example by showing it in grey).

2.3 Highlighting Scientific Consensus and Controversies

ScienceBrief builds on an existing 'Map of Current Knowledge', or MoCK. MoCKs are developed by an Editorial Board and are based on existing scientific assessments such as IPCC or IPBES reports.

[11] See Minx, J. C., Callaghan, M., Lamb, W. F., Garard, J., & Edenhofer, O. (2017). Learning about climate change solutions in the IPCC and beyond. *Environmental Science & Policy*. https://doi.org/10.1016/j.envsci.2017.05.014

MoCKs are formed of 15-25 statements that together form the current scientific understanding of a topic.

MoCKs have time stamps, so that only publications available since the time stamp can be submitted to the MoNK. This assumes that the MoCK statements when they are written take full account of the published literature at the time. MoCKs can be updated regularly (every 1 to 10 years depending on the field).

Once a MoCK is published, contributors are invited and encouraged to submit publications available since the time stamp, which then show the evolving state of scientific understanding relating to the statements.

For example, if lots of new publications supported by lots of experts confirm the MoCK statements, the scientific consensus is strengthened.

Conversely, if new publications refute or contradict existing MoCK statements or if the contributions are polarised or divisive, controversies arise that could trigger new research. The outputs of ScienceBrief relating to a specific MoCK statement are two-fold. First and most central to the purpose of the project, a continuous assessment of the knowledge-base for a given statement is created and kept up to date. This we call the 'Map of New Knowledge' or MoNK. Second, an updated list of relevant core publications is created suitable for use as the start of a literature search.

2.4 Domains and Emerging Topics

The majority of the topics supported within ScienceBrief will be in mature research areas with a large pre-existing evidence-base that can be linked against the MoCK statements. In addition, a small number of emerging topics, for which there is a smaller existing evidence-base and no pre-existing scientific assessment, will be supported. Emerging topics will differ from established domains in in how they are presented:

- statements will be formed of questions rather than affirmations
- statements will not be based on existing scientific assessments
- different visual style (colour highlighting) will be used
- instructions may be differently worded for emerging versus established topics (for example to allow for a greater use of less established literature)

The metrics to judge evidence (including quality and relevance) will be the same. For simplicity, in this document we use the work 'domain' to encompass both the established MoCKs and emerging topics.

3 User Groups and Roles

ScienceBrief has distinct groups of users with specific roles, responsibilities, and therefore access levels. Users may belong to more than one group, may have different roles for different scientific areas, called 'domain' here. For example, a member of the editorial board in one domain may be a contributor in another domain.

The defined user groups are as follows: Governing body, Editorial Board, Expert, Content Administrator, System Administrator, and Public.

3.1 Governing body

Beyond the Pilot phase, ScienceBrief will be governed by a governing body steered by the Tyndall Centre at UEA and including international advisors and representative of key Stakeholders (e.g. IPCC[12] and IPBES[13]). The exact composition of this governing body is to be decided. The responsibilities of the governing body include:

- Establish a process to determine new domains
- Create new domains and define their scope
- Decide the size of the editorial boards and select their Chairs and members
- Help maintain high quality and credibility of ScienceBrief
- Evaluate and report results and make recommendations for improvements
- Help secure the long-term funding of ScienceBrief.

The Governing body will be created at the end of the pilot testing (in 2019).

3.2 Editorial Board

One editorial board will be appointed for each domain. The responsibilities of the editorial board include:

- Decide on the number of statements to be included in the MoCK
- Create the MoCK, where possible drawing on existing scientific assessments and supported by a peer review process (either formally through the submission of a journal paper or informally through established network such as Future Earth).
- Encourage wide contributions to the MoCK
- Monitor the MoNK and ensure contributions are transparent and of high scientific standard
- Determine the time scales for MoCK updates, in consultation with the governing body and as appropriate to the domain e.g. seven years for IPCC-related statements and faster for rapidly evolving fields
- Update MoCK statements within the agreed timeline, incorporating a peer-review process prior to finalizing the update

The editorial board members are expected to be highly regarded experts in the domain field and to have good engagement with the platform and process, of the same level as journal editors.

3.3 Expert

Experts are split in two categories on the ScienceBrief platform, to allow the user to view separately the assessments from 'all experts' from that of 'top experts' in the field. All experts include self-declared experts, while top experts include the Editorial Board and other experts that have been vetted explicitly by the process (see below). The Editorial Board can also nominate top experts, for example all the authors of past and ongoing international assessments in the domain examined. By default,

[12] Intergovernmental Panel on Climate Change

[13] Intergovernmental Platform on Biodiversity and Ecosystem Services

Experts are grouped within a domain and can assess publications associated with other statements within a given domain. Options to filter Experts to unique statements will be provided.
Within the expert category there are multiple roles as described below.

3.3.1 Contributor (self-declared experts)

Anyone linking a publication to the MoNK who has confirmed the self-declaration of expertise for a given domain. The self-declaration of expertise is requested the first time the contributor submits a contribution to a specific domain (see Box A).

A user becomes a contributor by linking a publication to a specific MoCK statement, and by providing their best judgement of how it informs the MoCK statement. This includes a short free interpretation and a quantitative assessment (see Operational Process for what is asked from who and when).

Text provided by Contributors is free access and does not need to be attributed if it is used elsewhere (e.g. in the IPCC/IPBES assessments). The references for publications will be downloadable to facilitate their use in assessments (anticipated mid-2018).

Box A. Self-declaration of relevant and sufficient expertise

Before making contributions to a domain, Contributors will be asked to confirm that they have sufficient expertise to do so. The following text will be used:

Thank you for joining ScienceBrief. In order to make a contribution, you need to have sufficient relevant expertise. You are trying to submit a contribution to 'Domain-name'. Please confirm that you have sufficient expertise in this area to provide informed comments on the publications. For example, you have published peer-reviewed papers or high-quality reports on this topic yourself, or you are a researcher in a closely related area, including PhD researchers.

3.3.2 Corresponding Author (experts based on publications)

The Corresponding Author of a publication submitted to a MoCK statement. For a peer-reviewed paper, this is stated directly on the paper. For other types of publications, the first author is used as Corresponding author. Corresponding authors will be emailed automatically when *their* publication is linked and will be invited to revise the interpretation and assessment if needed.

3.4 Content Administrator

A nominated administrator who acts on behalf of (on instruction of) the editorial board. This role is needed specifically to support non-technical input and assist time-poor board members. For example, the content administrator can upload domain statements on the ScienceBrief platform once they have been agreed by the editorial board.

3.5 System Administrator

Someone with the technical and operational responsibility for the maintenance of the ScienceBrief platform overall. Access to all areas and providing troubleshooting and assistance to all users.

3.6 Stakeholders/users

Any user of the system whether registered or not, whether part of any other user group or not, will be able to view all public data such as the MoNK and interact with public interfaces to the system.

Careful consideration will be given to providing a "public portal" regularly updated both automatically and manually to allow easy access to certain sections, the highlighting of new or newsworthy content, or linking to other outputs. In-built filtering and analysis tools will guide public users through filtering the data for statements against certain requirements (Experts only etc), and help them explore the findings.

It is anticipated these "public" users, whether registered or not, will fall into different categories with different wants and needs. An initial identification of these user groups and primary interests is as follows:

- Governments/public Sector – interested in how emerging scientific evidence can influence evidence-based decision-making.
- Private Sector – interested to find key people and evidence for given topics and potentially considering the commercial implications of evidenced scientific opinion.
- Academic community – interested (and perhaps contributing) in their areas of expertise and interest. This would include both established academics and early-career researchers and students who want to gain an oversight of the live issues and keep up with related literature.
- NGOs – researching evidence in a given domain perhaps as a source for a report or strategy.
- Public/civil society – interested in live issues and on the scientific consensus on topics of interest.
- Journalists and bloggers – interested in live issues, new insights and emerging topics.
- Schools – interested to support students research projects and update lecture material.

4 Operational Process

4.1 Overview

An overview of the generic process related to a ScienceBrief domain is shown in Figure 1. This figure includes highlighted points (red circles) which are referred to in the text for clarity. The operational process includes four main phases. In Phase 1 the domains and statements are defined before phases 2 and 3 in which input is invited from experts to gauge the interpretation of publications relating to the statements, with experts able to provide input into other statements once validated. Finally phase four involves the periodic review and upkeep of the domains, potentially with the creation and reassessment of statements. These phases are explained in full below.

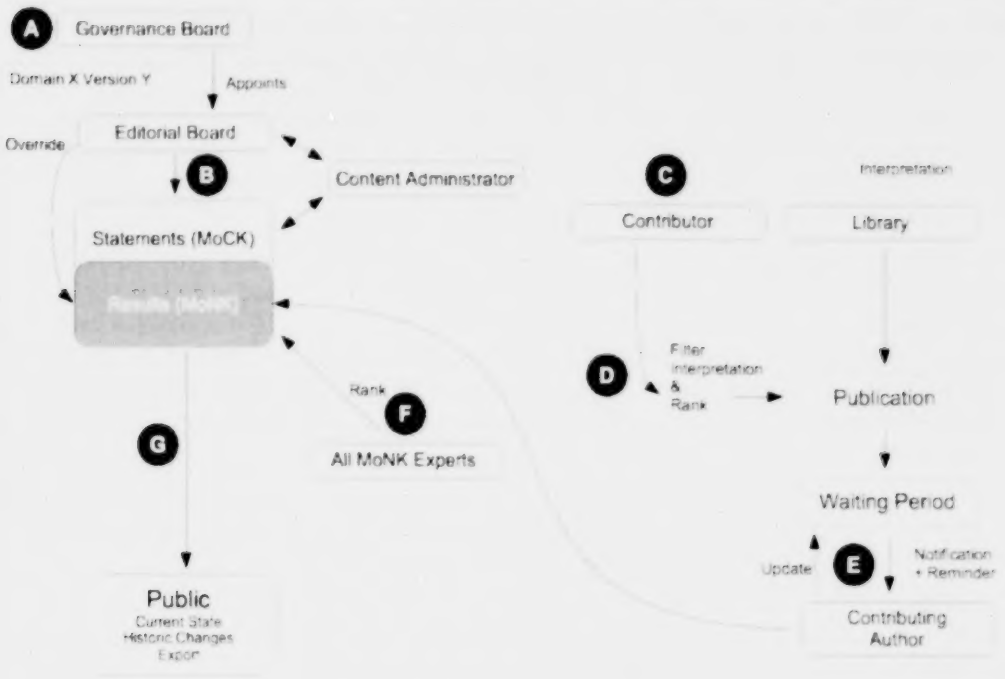

Figure 2. ScienceBrief generic process overview. The steps highlighted in red are described below.

4.2 Process Details

4.2.1 Phase 1: Definition of Domains and MoCK Statements

A domain is defined by the governing body, with its title and scope.

An editorial board is appointed by the governing body (Fig.1 highlight A).

The editorial board defines the MoCK statements.

Editorial board members may interact directly with the ScienceBrief platform or nominate a content administrator to handle the technical aspects.

MoCK Statements

MoCK Statements are at the heart of ScienceBrief. Statements reflect the current state and limits of understanding, including the confidence level as defined by IPCC (Fig. 1 highlight B) and IPBES. MoCK statements are defined at the start of a process and are available as soon as the domain is launched.

The pilot phases will test statements of various complexity (See Section 8). The current thinking is for statements to include three sentences, one stating the obvious, one providing some quantitative assessment, and providing less robust evidence but with confidence level. The last sentence is meant to identify the cutting edge around a particular statement. Here are two examples from the carbon cycle pilot area:

- Observed atmospheric CO_2 increase this century is caused by human activities. The increase in atmospheric CO_2 concentration since pre-industrial times (around 1750) was caused by CO_2 emissions primarily from fossil fuel burning and secondarily from land use change. On average since 1958, about 45% of the total emissions remained in the atmosphere annually. The rest was removed from the atmosphere by the ocean and terrestrial reservoirs - the so-called carbon sinks - in approximately equal proportions. The principal drivers for the increasing sinks is the CO_2 increase in the atmosphere.
- Carbon feedbacks to enhance climate change but no runaway effect to 2100. Climate change affects carbon cycle processes in a way that exacerbates the increase of CO_2 in the atmosphere. That is, climate change partially offsets increases in land and ocean carbon sinks caused by rising atmospheric CO_2. The effect of climate change on the carbon cycle ranges from -20 to -145 GtC per degree of global warming on the decadal to century time scale. Additional carbon releases from permafrost melting and methane hydrates add no more than 30% above this range.

At least two members from the Editorial Board will monitor each MoCK statement. Feedback relating to the statement, alerts, actions requiring Editorial Board input etc will go to the assigned board members only to avoid overloading the entire Editorial Board.

MoCK statements will be updated on a regular basis as determined by the Editorial Board. Following these updates, statements could be added, removed, or refined as needed to reflect feedback, changes in the scientific field, or to incorporate emerging topics (Fig. 1 highlight B).

4.2.2 Phase 2: Contributions and expert inputs

Once the MoCK statements are available and launched, the domain is open for contributions (Fig. 1 highlight C).

The Contributor registers to ScienceBrief (on first login), login to the system, and passes the expertise filter to the domain (on first contribution; see Box A).

The contributor is invited to setup a profile and link items such as institutional homepages and research accounts (i.e. ResearchGate or ORCID ID) – see User Accounts for more information.

From this point the process is as follows:

- The Contributor links a publication to a MoCK statement, either from an existing record in pre-loaded library or by entering new details (see Library; Fig. 1 highlight D)
- The Contributor assesses among five options if the publication supports or refutes the statement or facet(s) of it and to what degree
- The Contributor makes a brief textual statement explaining their interpretation and what is the new information provided by the publication in relation to the statement (max 75 words)

At this point the publication is linked to the statement and visible as a linked element but it is not included in the MoNK results. The contribution triggers a "waiting period" (Fig. 1 highlight E), to allow the corresponding author of the publication (the 'Expert' here) or the Editorial Board time to comment. The length of the waiting period could be set initially to one week, to be revisited at the end of the Pilot phase. Issues may arise for example during holidays or parental leave. The short waiting period implies that Editorial Board members are implicitly covering for Expert leave.

The linking of a new publication by a contributor will trigger the following events:

- The publication is analysed (automatically with manual options) to find the Corresponding author.
- An email is sent to the Corresponding author (now a Top Expert) with copy to the Editorial Board members monitoring this statement, with the details of (i) the statement, (ii) the contributor assessment for support/refute, (iii) the textual explanation, (iv) the applied tags. Any other assessments are not sent to the Corresponding author.
- The Corresponding author is then asked to either accept or update the assessment and optionally to modify the interpretation.
- The Editorial Board members monitoring this statement do nothing, unless they judge comments are inappropriate or abusive, in which case they can override or delete the Contribution provided they justify their action.

If the Corresponding author does not reply, a reminder is sent towards the end of the waiting period. If the period expires without a reply, the publication is flagged to the Editorial Board who then needs to approve the submission before it is included in the MoNK.

After the Corresponding author has responded or the waiting period has expired, the publication is linked with the statement and the corresponding assessment and interpretation are visible to all.

At this stage all applicable users (Contributors and Top Experts – see Section 3) can interact with the new publication (Fig. 1 highlight F) to:

- View the support/refute assessment and interpretation (access to the history of the assessment and text will be possible through a 'view history' link)
- Provide their assessment of the quality of the publication (by putting a star on top quality publications)
- Provide their assessment of the interpretation (if they agree or disagree with the corresponding author's or contributor's submissions, and if they wish to explain why and what their own assessment would be)

Once a statement has publications openly linked anyone can view the results of the statements (Fig. 1 highlight G) which would include:

- All the linked publications and their scores and interpretations. Publications are ranked by their quality and expert support, by default from the Top Experts only but a view option for all experts, and an option to highlight controversies. Different rankings are to be tested during the pilot phase.
- The combined metrics for the evidence to see if there is a consensus on the statement.

All the changes are logged and historic data can be seen for transparency purposes, except for offensive comments which will not be shared publicly.

4.2.3 Phase Three: Ongoing Interaction

Once a user is linked to a domain (either as a Contributor or an Expert) they can optionally receive regular alerts (configurable by the user for frequency and detail). These alerts may include:

- New papers linked to a statement
- New papers within a domain

- New or updated statements within a domain
- A major change in the result for a statement or statements within a domain

4.2.4 Phase Four: Updating MoCK statements

MoCK domains will require regular updates, that ideally will be linked to major assessment reports from the Stakeholders that take place every 5-7 years. However, in some cases, more frequent and interim or partial updates may be necessary or desirable. The Editorial Board has the responsibility to determine the frequency and timing of the updates. The governance of this decision will be detailed in the governing practice, the process to be detailed by the governing body towards the end of the pilot phase.

Updates will trigger the following:

- the Mock time stamp is updated, and only publications published after the new time stamp is accepted in the new MoNK. Therefore, the new MoCK statements are initially empty at the time of the update.
- Peer-review of the revised statements by experts and Governments, i.e., the new MoNK, is strongly encouraged
- the old MoCK and associated old MoNK are frozen and archived and available through the site history or by clicking on the statement; metadata is provided (e.g. number of papers submitted, number of Contributors)
- Experts remain permanently associated with the Domain even if it is updated. Likewise, Contributors do not need to reaffirm their expertise.
- an update will be a major event in ScienceBrief and should be celebrated and publicised

Updates will be tested during the pilot phases.

5 User Accounts

User accounts will be records within the system tied to email addresses allowing distinct users to authenticate to the system, and for their user account to be assigned to one (or more) groups (such as Contributor and Expert) within a given domain.

Accounts can join a domain through their own action (with a expert filter) or be manually assigned. Accounts can also be manually created for others, for example a team leader or similar can pre-create accounts for colleagues or staff.

User accounts will be tagged depending on information available about them e.g. academic user, published researcher, etc.

Users will be encouraged to use their institutional email for registration allowing some automated determination of tags.

All users will have a profile page where they can put a brief description but also link to other online resources such as their institutional page, a profile on ResearchGate or similar, or a publication list of Scholar or another archive.

Users will be able to achieve accolades and due recognition for contributions (see Building Engagement) which will also be displayed on their profile.

In addition to standard password authentication users will be able to make use of third-party authentication systems such as Google and Facebook should they wish to do so.

6 Library

To support easy and reliable linking of publications to statement it is required to build a library of such publications although for many of them only metadata will be held.

Where possible the actual publication will be held internally (to allow easy location and full text searching, detection of authors, etc). The platform will show the publication to the level allowed by copyright which for most papers will be an abstract with a link to the full version of the paper on the publishers' website.

Publications are added to the library in two ways as follows:

1. **Automated Searching** – domains can have associated keywords which are then used by automated back-end systems to search third-party catalogues such as Google Scholar and Microsoft Academic adding record data (and full-text if available) into the library. Note that publications being in the library does not mean it is linked to a domain or statement, merely that it is available to do so.
2. **Manual Addition** – users who wish to contribute (and any nominated expert or editorial board member) can add publications to the library either through doi, direct upload (PDF etc) where the metadata is scraped out or by entering metadata fields if the actual document is unavailable, inaccessible, or not fit for automated analysis. All contributed publications are automatically included in the wider library.

Records contained in the library can be searched, viewed and ordered in the following ways:

- Direct text search for general literature – a standardised text-based search with additional optional fields to find publications /literature records held by the system (this also forms the basis of the spin off SciLiX Literature System[14]); where applicable publications can then be linked to a statement. This is one way in which someone can find publications to link against a statement, and avoids the need to manually enter details or upload a document every time.
- Statement (and/or Domain) publications summary – a list of the publications included against a given statement (and by extension domain), ultimately this list will form a set of publications which will hopefully be the definitive key pieces relating to a topic so a good basis to begin a literature review.

7 Building Engagement

One large potential risk to ScienceBrief is a lack of users or engagement (see Risk Management). For the platform to generate outputs showing consensus a significant number of experts do need to contribute their opinions and publications.

A multi-track approach to try and build engagement with the platform is therefore proposed. As the pilots and system become live (see Implementation Plan) then consultation with professional media

[14] SciLiX is an interface to the evidence library using the same user controls and credentials which allow users to create arbitrary groups of literature and share and collaborate on these with other users. In this way it is intended to be a collaborative tool for literature review which can be unrelated to the domains or statements within ScienceBrief itself. SciLiX will be available for technical preview in 2017.

managers within the host organisations will take place, i.e., UEA. The general themes of the current planned approach are as follows:

- **Key stakeholders**: Using existing academic and professional networks key stakeholders in given domains should be engaged and enthused about the project. Ideally they would contribute new publications and some form part of editorial boards and as such they would also hopefully advocate for the platform and encourage early career scientists to take part.
- **Early-career researchers**: The engagement of early-career researchers (including PhD students and similar) is pivotal to ScienceBrief, as it is anticipated that this community will be most engaged and will benefit personally from their Contributions (for example as a conduit to feed into international assessments). Engagement specifically with these groups will be developed to identify what would encourage them to make use of the system (for example is there a Vitae competence or other similar record that could be met through contribution).
- **Wide community engagement**: Opportunities should be taken to present the system and its prospects, current results, and future potential to workshops and stakeholder groups as applicable to build visibility and enthusiasm, for example during side events at UNFCCC and IPCC for climate and CBD/Ramsar, CMS, Cites and IPBES for biodiversity.
- **Pilot visibility and results**: The pilot studies should be as visible as possible and the findings disseminated as widely as practical generating interest not just in the results themselves but the process (and its potential application to other domains). Interesting results in the pilot studies become news stories in themselves spreading the abilities and features of the platform.
- **Partnerships and collaborations**: Opportunities for partnerships should be explored and collaborative opportunities for related projects taken where beneficial advertising in kind to each other's' stakeholders and users is possible.
- **Social media engagement**: Build the social media presence of the platform and engage through social media with related or partner organisations.
- **Encouragement:** Provide a system allowing for due recognition of contributions made, through the profile screen showing the volume (and type) of contributions made to encourage continual use.
- **Offer the additional benefits**: As well as the primary purpose to continually assess consensus the tool will also act as a literature collection and sorting engine so a good starting point for literature reviews.

8 Pilot Areas and evaluation

On launch (see Implementation Plan) the system will be trialled in three domains: Energy, Climate, and Pollination.

8.1 Energy-nature interactions

This pilot area will build on the UK ADVENT project, Addressing Valuation of Energy and Nature Together, which is linked to the funded NERC project. The pilot will be developed in Spring 2018.

Primary Coordinator:	Professor Andrew Lovett
Coordinating Body for Editorial Board:	Tyndall Centre at UEA

8.2 Carbon-climate interactions

This pilot area will build on the IPCC 5th Assessment report, Chapter 6 of Working group I on Carbon Cycle and Other Biogeochemical Cycles. The pilot will be developed in Spring/Summer 2017.

Primary Coordinator: Professor Corinne Le Quéré

Coordinating Body for Editorial Board: Tyndall Centre at UEA

8.3 Pollination

This pilot area will build on The Assessment report on Pollinators, Pollination, and Food Production of IPBES, Plenary-approved in February 2016. The pilot will be developed in Autumn 2017.

Primary Coordinator: Professor Robert Watson

Coordinating Body for Editorial Board: Tyndall Centre at UEA

8.4 Evaluation

Each pilot areas will be evaluated and analysed through different lenses, including for the operational issues, the quality and volume of the results, and the user experience and outreach.

8.4.1 Operational issues

- Duration of the waiting period and workload for administrators and Editorial Board
- Detection of papers (can the platform identify all relevant papers)
- Flow of email exchange
- Dealing with obsolete emails and away message

8.4.2 Results

- Quality and simplicity of the MoCK statements in relation to the results.
- How hard was it to relate papers and interpret them in light of the assessment?

8.4.3 User experience and outreach

- Level and quality of expert engagement
- Do we see the good papers at the top and is it easy to interpret?

9 Risk Management

Risks are split into three categories:

- **Implementation** – Risks associated with the implementation of the ScienceBrief system during initial development and the early phases of the project
- **Technical** – Technical risks associated with the ongoing provisioning of the ScienceBrief system during its life
- **Operational** – Risks associated with the ongoing provisioning of the ScienceBrief system during its life excluding purely technical risks

9.1 Implementation Risks

ID	Risk Description	Likelihood / Severity	Mitigation

I1	Project unable to be delivered owing to unfamiliar new technology	1 4	Early trials on SciLiX platform, defined technology platform, industry standard. Experienced developer.
I2	Project delivered late owing to lack of resources	1 3	Defined budget including technical skills, human resources available
I3	Project delivered late owing to illness or other absence	2 3	Industry standard development so could be taken on by another party. Good documentation
I4	Significant scope change/creep	1 3	Full scope and agreed deliverables
I5	Lack of development resources	1 1	Development hardware already provided, all software free and open source
I6	Lack of project oversight leads to overrun	1 2	Agreed project plan, dedicated staff member, regular progress reviews

9.2 Technical Risks

ID	Risk Description	Likelihood / Severity	Mitigation
T1	System subject to successful hacking attempt – insecure	2 2	System fully backed up, no confidential data held (everything is transparent) and can be reconstituted from backup
T2	System subject to DOS-style load attack	4 2	Third-party network provisioning (probably UCL) reliable for hardened network. Can consider third-party CDN if required or full cloud hosting. Not business critical function so unavailability has no specific cost and would return after attack is blocked
T3	Data loss on provisioning server	2 2	Ensure regular backups are taken and saved, use standard frameworks, document recovery practice
T4	Platform upgrades lead to lack of functionality	2 4	Industry standard coding practice and frameworks used, will also be updated to use newer versions. Documented upgrade process (through composer)
T5	Technical bug detected during operation	3 2	Industry standard and documented codebase, any experienced developer with platform knowledge could address issues

9.3 Operational Risks

ID	Risk Description	Likelihood / Severity	Mitigation
O1	Insufficient engagement and user levels mean no useful results	2 3	Key leaders for each domain identified to engage and enthuse other people. Trial areas. Public and community engagement.
O2	Vested interests overly influence – people with a specific agenda	3 2	The editorial board has final control over updates and content (in a transparent manner)
O3	Concerted effort to "game" the outcome of a statement or domain	3 1	Filters based on the user account types
O4	People not meeting the criteria self-declaring as experts	4 1	Validation is possible through linking other details. Although contributions are welcome from all the outputs can be easily filtered for example to only include authors or people with academic profiles
O5	Paper authors incorrectly (in the view of editorial board or senior expert in field) override or assign their paper	3 1	Editorial board can (transparently) override
O6	Modification to system function required	4 1	As T5
O7	Allegations of bias or agenda within the ScienceBrief team	4 1	Transparent processes followed and auditable results
O8	False or invalid publications linked	4 1	Identified during "waiting period" and can be easily (transparently) removed. Users also can be blocked.

10 Technical Details

ScienceBrief will be implemented as web-based platform.

Server-Side Platform and Technology

- Linux Server
- Python 3
- Django Framework

Client-Side

- HTML 5 Application using React Framework
- Compatible with all major browsers (IE, Firefox, Chrome, Safari)
- Mobile-first development with responsive CSS 3 via LESS

Data Exchange

- RESTful API on Server
- JSON Exchange (bidirectional)

11 Implementation Plan

The ScienceBrief app will be built over several stages, each designed to allow early feedback and a solid base for iteration, whilst minimising security issues and brand damage to could occur through radical changes or errors on a fully public user base. Each stage is progressively more open, working towards full public registration; In this manner, scaling issues relating to administration are also mitigated.

Stage 0: Alpha

The Alpha version is for internal use only. It is designed to have the minimum feature set in order to generate feedback for iteration, record screencasts and demonstrate viability and conceptual coherence to the project vision before the first users.

The feature set of this version will include:

- Publications will be limited to published papers (has DOI or easily findable on MS knowledge API). This is a technical limitation regarding duplication of documents and will need careful consideration to resolve in the future. At present, a uniquely identifier (DOI) will prevents duplicate submissions in a straight-forward manner, allowing a more rapid advancement of the features relevant to the core user experience. More types of publications will be added in subsequent versions with a way to ensure no duplication is possible.
- Users will be internal only.
- All authorisation endpoints: registration, login/logout, and password reminder.
- Email (possibly with Sendgrid) for authorisation emails.
- Shadow author email profiles to be created upon submission of an article if it does not exist. This will be relatable to an existing user, or claimable by a user; though the actual attachment may be manual at first.
- Administrator console will allow manipulation of underlying data and creation of statements, users, domains etc.
- Download citations list relating to a statement.
- Download comments relating to a statement

- An author or the editorial board will be able to accept a statement and amend the relating interpretation and for/against rating.
- Roles and initial permissions to allow or prevent changing the data and voting.
- Statement results graph and filtering of votes (to distinguish between contributors, authors, statement experts and domain experts).
- Statements will have a cut-off date for publications; no publications published before this date will be submissible.
- Statements with no cut-off date permit any publications to be added against it.
- Domains will have a flag indicating if they are an emerging topic.

Stage 1: Closed Beta

The Closed Beta version should be very close to the Alpha with the major exceptions being deployed on the internet and having a set of invite-only users.

The feature set of this version will include

- Users will be invite only and a list of emails of people who are allowed to register will be held in the database (stretch goal to have a mailing list of people who wish to be notified of when they can join).
- Cron for email sending and periodic tasks.
- Centralised logging store (e.g. Papertrail, Loggly, etc.)
- Authors are emailed only virtually (published as an event to a logger) with a view to gathering statistics on what level and frequency an author may be emailed. The goal here is to increase engagement, particularly from authors, whilst at the same time ensuring the are not bombarded with spam.
- Deployed to the internet with a deployment process in place.
- Front page for beta testers explaining how the app works and their role in it.

Stage 2: Public Beta/Trial

The Public Beta should be as close to the Closed Beta so as not to introduce bugs. In this sense, the feature set itself will not change much in order to balance the larger change in operational management.

The feature set of this version will include:

- Sending email to authors will be switched on. Authors will be able to click a link in the email to
- People can register. This will be implemented by allowing specific whitelisted domains (e.g. *.ac.uk*, *.edu*), in addition to invitations. The goal here is to once more increase the public level of engagement with the tool whilst ameliorating scaling issues, both technically and operationally. This is a similar approach to how Facebook was rolled out, beginning with only certain universities and eventually fully public.
- Results will visible to the public.
- Front page for the public
- Continuous integration will be in place to ensure tests are run and successfully pass before a merge is allowed in the master branch.

Stage 3: Future versions

Additional changes and features will be heavily dependent on feedback and usage from the previous stages and so listed below are further potential features not in priority order and subject to change, they include:

- Full public registration.

- Tie archived statement to new one.
- Notification system so messages can be received in the app.
- Blog and mailing list.
- Community voting for statements to consider
- Grey literature and additional scholar sources
- Full site search
- Elastic Search for real time search within library
- Library export and share features
- Researcher ID to unique person identification.

12. Sub-Appendix A: Use of the software outside of ScienceBrief

Note: this section refers to the potential use of the software by a third-party outside of the ScienceBrief brand or purview and is only included to capture possible areas of variability to allow for future use.

The initial application of ScienceBrief will be in a set of controlled pilot areas which may be expanded into more domains or with more statements. A key requirement of the method is that results are transparent and of high quality. Quality specifically means the standard of experts contributing, the number of contributions, and the standard of the publications used.

For this reason all of the domains run within the purview of ScienceBrief will have very high quality standards set e.g. contributors and publications must meet the same standards as those to be included or contribute to the IPCC report. This avoids diluting or bringing into questions output from the "ScienceBrief brand".

However there is no reason the techniques and technology (the software platform) cannot be deployed elsewhere (under a clearly different identity), where more flexibility can be allowed (it is up to the people running the implementation), so some areas of flexibility exist even if they are stringent in the ScienceBrief implementation.

For a given domain the managers of the domain (the editorial board or upload administrator or system administrator acting on their behalf) can define the constraints that apply. By allowing constraints on a per-domain model the best flexibility is allowed for as other domains may require a more or less stringent policy.

The primary constraints fall into two areas, the Expert Qualification and the publications Standard. Furthermore every domain can have its own Language Settings.

12.1: Expert Qualification

This refers to the filter that contributors must pass through before being allowed to link publications to statements. It is liable to be very variable depending on the domain. The initial trials (see Pilot Areas) will use self-determination whereby the contributing expert must confirm they meet a given standard or test.

In the initial implementation two types of filter will be supported:

Self-Assessment: a statement/message/text is shown to the potential contributor when they wish to join a domain and they must self-assess and confirm they meet the required standard.

Manual Assessment: membership of the domain (which may also include a self-assessment phase) is not finalised until every application is reviewed and accepted by a member of the editorial board (or their nominated upload administrator).

Note that the editorial board can at any stage chose to override and remove a user from their domain, and may also add a user directly as a nominated expert (see User Groups and Terminology).

12.2 Publications Standard

Publications within a given domain can be requirement to meet a set standard or be one of a given category, for example only peer reviewed sources or similar limitations. Contributors will be asked to assess the publications against the standard and also tag it on submission.

During the waiting period (and afterwards but ideally before the end) the Editorial Board or nominated administrator on their behalf may remove the publications if it does not meet the set standard.

As with expert qualification there is expected to be significant variation in this between domains with some domains only taking authoritative peer-reviewed scientific literature and others accepting grey literature or even news reports/press releases.

12.3 Language Settings

The editorial board can define the descriptive language that best suits the domain for their rankings and categories for example for each of the 5-point metrics (Support/Refute) different descriptors can be used.

For example:

- Strongly Refutes, Refutes, Neutral, Supports, Strongly Supports
- Very Negative, Negative, Neither Negative nor Positive, Positive, Very Positive

For the assessment of Quality, Relevance, Significance, these will initially only be given an up and down button, effectively providence a 3-level scale (low, neutral, high).

13 Sub-Appendix B: Similar systems

Although no equivalent system exists for ScienceBrief there are a number of open platforms that aim to build consensus through crowd-sourcing of opinion. In this appendix we briefly touch on two of the most popular of these: the Stack Exchange Network and Wikipedia.

Note the significant difference between these systems are ScienceBrief is the level of quality control that ScienceBrief exerts, primarily because it is based on published publications by reliable sources. ScienceBrief exerts also additional filters of expertise through the Editorial Board evaluating the publications (MoNK) and updating the MoCK. In fact one of the commonly presented weaknesses with systems such as Wikipedia is the lack of such control, leading to spurious editorial changes and fake articles, an issue which will be clearly addressed and controlled in ScienceBrief. Although the comparison systems presented here do not have such control measures, the fundamental process of engaging community contributions is similar.

13.1 Stack Exchange

Stack Exchange is a platform upon which a wide number of different domain-specific question and answer sites are built. The original and best known of these is Stack Overflow which deals with programming and other software development queries. The network in total now includes a great number of individual domains ranging from engineering to Buddhism. Each operates with the same process:

- A (registered) user poses a question with freeform text and a title and tags
- Other (registered) users are encouraged to provide answers (or comments asking for clarification etc)
- Any (registered) user can then up-vote or down-vote the question (is it a good or meaningful question) and the answers
- The original question asker can "accept" an answer as correct

The system works on the premise that over time the better answers will be up-voted and "float to the top" (i.e. they will be the first answer any user sees when they access the question).

Additional features of note with the Stack Exchange system are:

- All (registered) users have a point score (a reputation score) which is a numerical value. Reputation points are given for "good" (your answer is up-voted, or accepted as correct, you have asked a good question etc) and removed for "bad" (your answer or question is down-voted)
- Higher reputations allow more actions to be performed such as commenting on an answer, or down-voting. This means a certain amount of engagement is required before potentially damaging actions and also helps to avoid spam as the account must have done certain actions
- Bounties can be offered whereby any (registered) user may offer some of their reputation points for an answer to a question that has been unanswered for a period of time (for example to encourage more engagement or a better answer) – this is not limited to the user who asked the question
- Badges are awarded for various actions and milestones and are at different levels of bronze, silver, and gold (for example Scholar Bronze badge where a user asks a question and accepts the answer or a Famous Question Gold badge where a user asks a question that has in excess of 10,000 views)

13.2 Wikipedia

One of the best-known and most visited websites Wikipedia aims to be "the online encyclopaedia anyone can edit". Wikipedia relies heavily on community involvement and a large team of volunteer editors, writers, and administrators to maintain the site.

Anyone can edit most entries on Wikipedia (with the exception of protected pages, see below) and can either create a user account or just edit the pages and the change is recorded against their IP address. Wikipedia automatically and manually award badges and special statuses and accolades on accomplishments or at the behest of other users.

Because of the open form of Wikipedia it has been subject to significant vandalism in the past including newsworthy stories such as politicians flattering themselves in their entries. Contentious issues are also the cause of "edit wars" with people on different sides changing the text to support or advocate a particular position, where Wikipedia aims to be neutral and factual.

Behind each entry (and each user account) is a discussion page where less-serious disputes (those that don't require the page to be locked or editor involvement) are handled. Often these discussions find a consensus in terms of what should or should not be included in the entry and an agreed edit is made to the content.

In contrast to Stack Exchange the Wikipedia system relies much more on community moderation and editor input.